

Sampling Fish for Bioassessments in Wetlands:

A Review of the Possibilities and Evaluations from Great Lakes Coastal and other Wetlands

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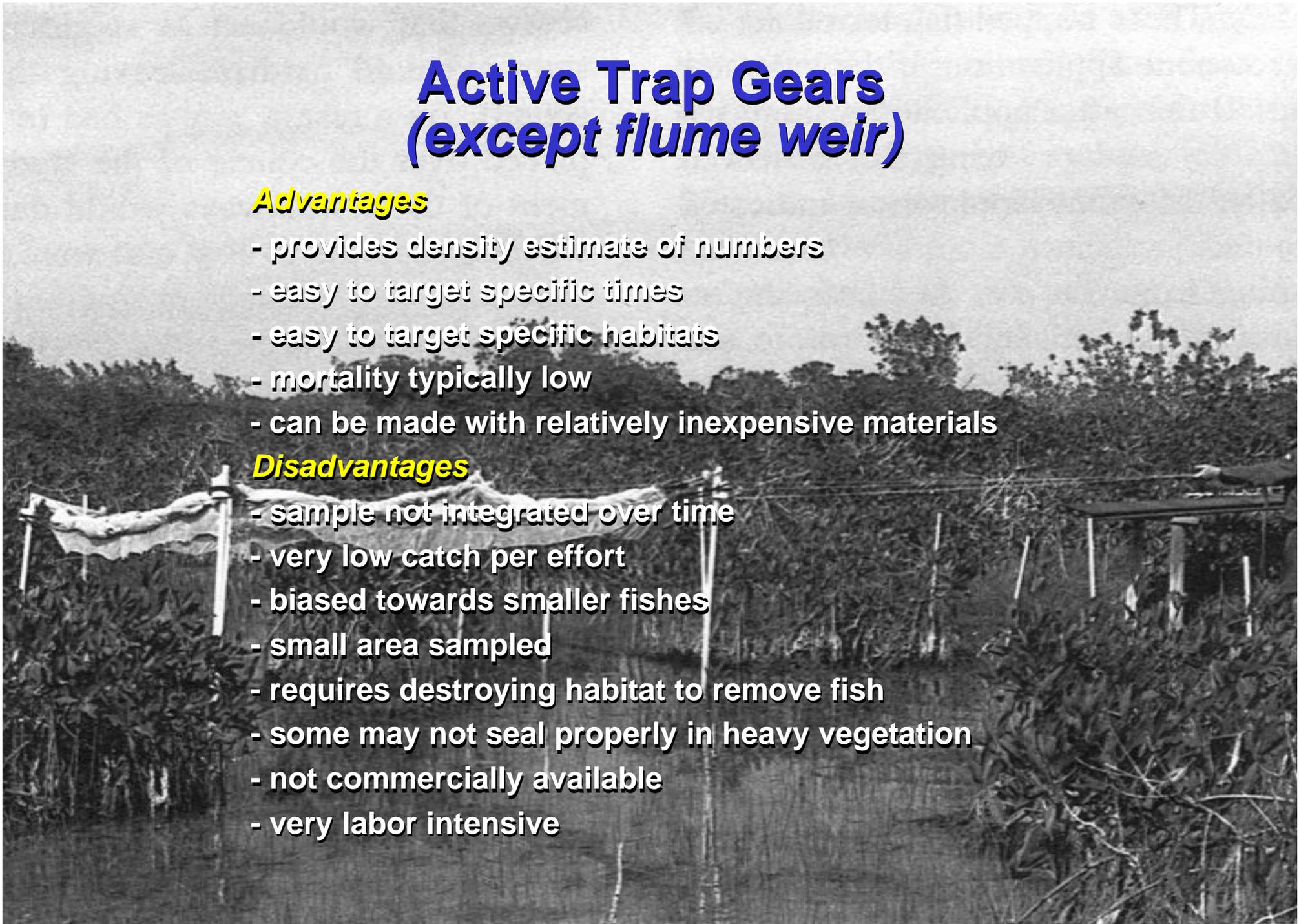
Active Trap Gears (except flume weir)

Advantages

- provides density estimate of numbers
- easy to target specific times
- easy to target specific habitats
- mortality typically low
- can be made with relatively inexpensive materials

Disadvantages

- sample not integrated over time
- very low catch per effort
- biased towards smaller fishes
- small area sampled
- requires destroying habitat to remove fish
- some may not seal properly in heavy vegetation
- not commercially available
- very labor intensive



Seines



Advantages

- cheap
- commercially available
- easy to target specific times (day/night, morning/afternoon)
- mortality typically low - easy to identify and return fish
- short sampling time

Disadvantages

- qualitative samples only
- not consistently effective in even moderately vegetated habitats
- difficult to use in soft sediments
- catch biased towards smaller/slower fish
- cannot target specific sizes/life-stages
- somewhat labor intensive

Juvenile and Adult Methods

Seines

- beach seines
- purse seines





Juvenile and Adult Methods

Electrofishing Gears

- backpack
- tote barge
- john boat
- quadrat/grid

Passive Trap Gears

Advantages

- integrated sample over time fished
- easy to target specific times (day/night, morning/afternoon)
- easy to target specific habitats (dense/moderate/sparse vegetation)
- mortality typically low - easy to identify and return fish
- wide range of sizes captured (20 mm and larger depending on mesh)
- can target specific sizes/life stages
- possible to assess direction of movement/migration patterns
- effective in all seasons (even under ice)
- relatively inexpensive (\$300-400/fyke- or trap-net)

Disadvantages

- catch biased towards most active fish
- does not provide density estimate of numbers
- somewhat labor intensive
- some fish less “trapable” than others (e.g adult carp and bass)



Juvenile and Adult Methods

Passive Trap Gears

- fyke nets
- trap nets
- hoop nets
- pound nets
- flume/block nets
- minnow traps

Larval Fish Methods

- drop box
- light trap
- tow sled
- hydraulic pumps
- fine-mesh seine



Summary of Adult/Juvenile Gear Characteristics

Gear Characteristics	Passive Traps	Active Traps	Electro-fishing	Seines
Density estimate		●	●	
Time integrated	●			
Time targeted	●	●	●	●
Habitat targeted	●	●	●	
Inexpensive	●	●		●
Commercial source	●		●	●
Quick			●	●
Mortality low	●	●	?	●
Habitat destructive		●		●
Size bias		●	●	●
Habitat bias			●	●
Labor intensive	●	●		●

Summary of Larval Gear Characteristics

Gear Characteristics	Fine-mesh seine	Tow-sled	Light trap	Drop box	Hydraulic Pump
Density estimate		●		●	●
Time integrated	●		●		
Time targeted	●	●		●	●
Habitat targeted	●	●	●	●	●
Inexpensive	●	●		?	●
Commercial source	●	●	●	●	●
Quick	●	●			●
Mortality low	●	●		●	●
Habitat destructive	?			●	●
Size bias			●	●	●
Habitat bias	●				●
Labor intensive	●	●		●	●

Larval Fish Methods Comparisons

La Bolle et al. 1985 - Tow Net vs Drop Box

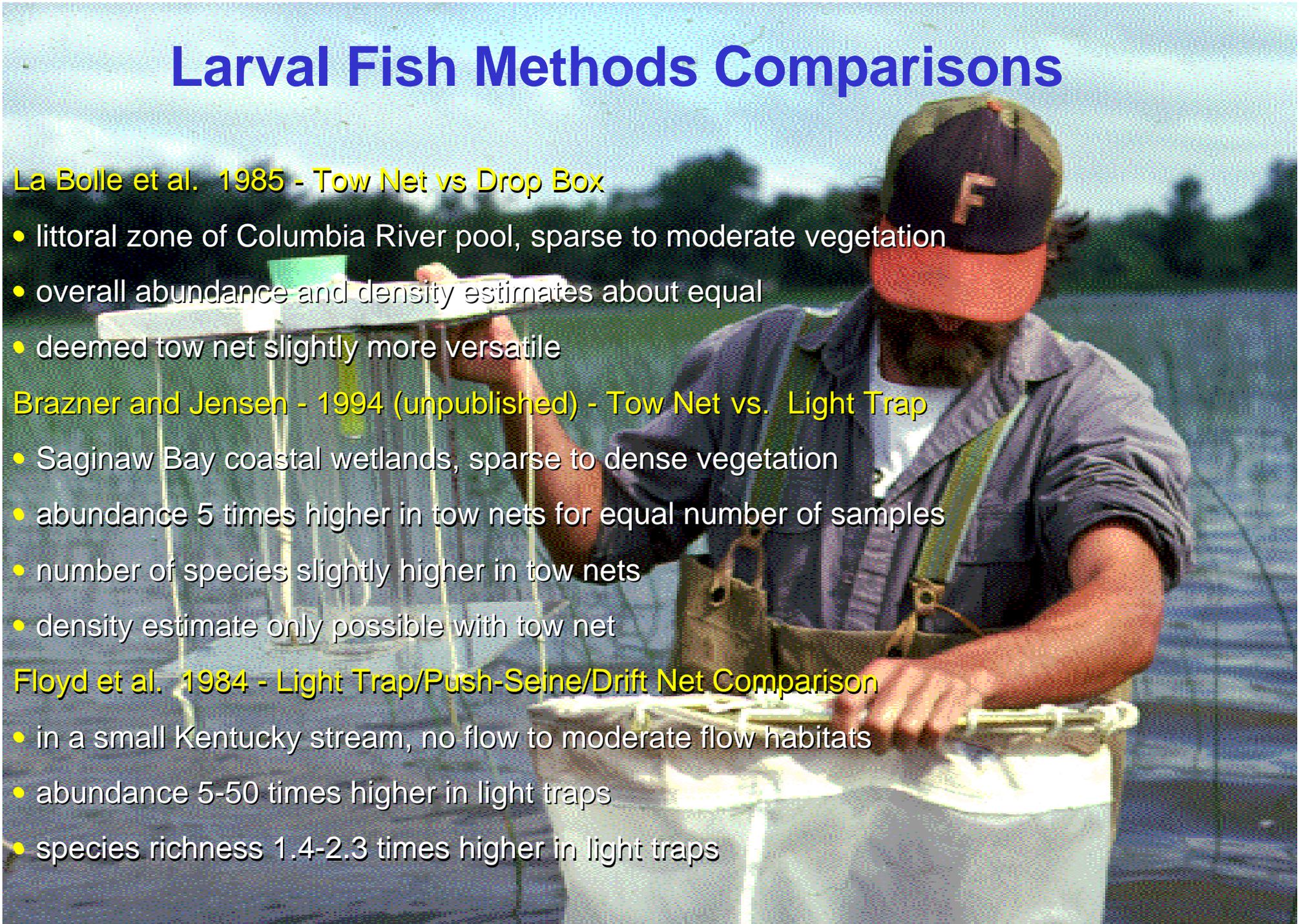
- littoral zone of Columbia River pool, sparse to moderate vegetation
- overall abundance and density estimates about equal
- deemed tow net slightly more versatile

Brazner and Jensen - 1994 (unpublished) - Tow Net vs. Light Trap

- Saginaw Bay coastal wetlands, sparse to dense vegetation
- abundance 5 times higher in tow nets for equal number of samples
- number of species slightly higher in tow nets
- density estimate only possible with tow net

Floyd et al. 1984 - Light Trap/Push-Seine/Drift Net Comparison

- in a small Kentucky stream, no flow to moderate flow habitats
- abundance 5-50 times higher in light traps
- species richness 1.4-2.3 times higher in light traps



Drop Net/Pop Net/Electrofishing Frame Comparison

Dewey 1992 - < 1 m vegetated backwater lake habitat

- *all sampled 5.6 m², Upper Mississippi R.*
- *preset all methods 30 minutes prior to act of fishing*

	Drop Net	Pop Net	Electrofishing Frame
Number of species	Most	Intermediate	Least
Number of fish	Most	Most	Least

drop & pop nets deemed about equal for sampling small fish in shallow, vegetated habitats

pop net not well described

Drop Trap/Throw Trap Comparison

Kushlan 1981 - < 0.5 m moderately vegetated Everglades marsh

	Drop Trap 1 m ²	Throw Trap 1 m ²	Throw Trap 2.25 m ²
Number of species	Least	Most	Least
Number of fish	Least	Most	Most
Accuracy and Precision	Worst	Intermediate	Best
Sampling Time	Least	Intermediate	Most

1 m² throw trap most effective and efficient

- much easier to use than 2.25 m² trap

Pop Net/Seine/Electrofishing Boat Comparison

**Serafy et al. 1988- < 01.5 m sparsely vegetated tidal freshwater
Susquehanna R. habitat**

- effort about equal across methods
- preset nets 4-6 h pre pop, 15 min to set

	Pop Net	Seine	Electrofishing Boat
	18.6 m ²	465 m ²	4000 m ²
Species per m ²	Highest	Intermediate	Lowest
Fish Density	Highest	Intermediate	Lowest

- pop nets give most accurate density estimates
 - Species richness only high on areal basis - need lots of pops to match absolute richness of electrofishing because of huge diffs in area sampled

Shallow-Lake Fishing Gear Comparison

Hayes 1989 - New Zealand, < 1.5 m, some vegetated littoral

	Minnow Trap (Fine-mesh)	Fyke-net (large-mesh)	Trap-net (fine-mesh)	Gill-net (3 larger-meshes)	Beach Seine (fine-mesh)	Purse Seine (fine-mesh)
# Species	5 (least)	4	1 (most)	3	1	2
# Fish	6 (least)	3	1 (most)	4	2	5
Size Bias	High	High	Low	High	High	High

*** note differences in mesh-size in among gears

Fyke-net/Seine/Gill-net Comparison

Weaver et al. 1989 - 8 Lake Mendota littoral zone sites

< 2 m, open to dense macrophyte cover

	Fyke-net (fine-mesh)	Seine (fine-mesh)	Gill-net (4 larger- meshes)	Minnow Trap (fine-mesh)
# Species	2	1	3	4
Abundance	1	2	3	4
Size-bias	Lowest	High	High	High

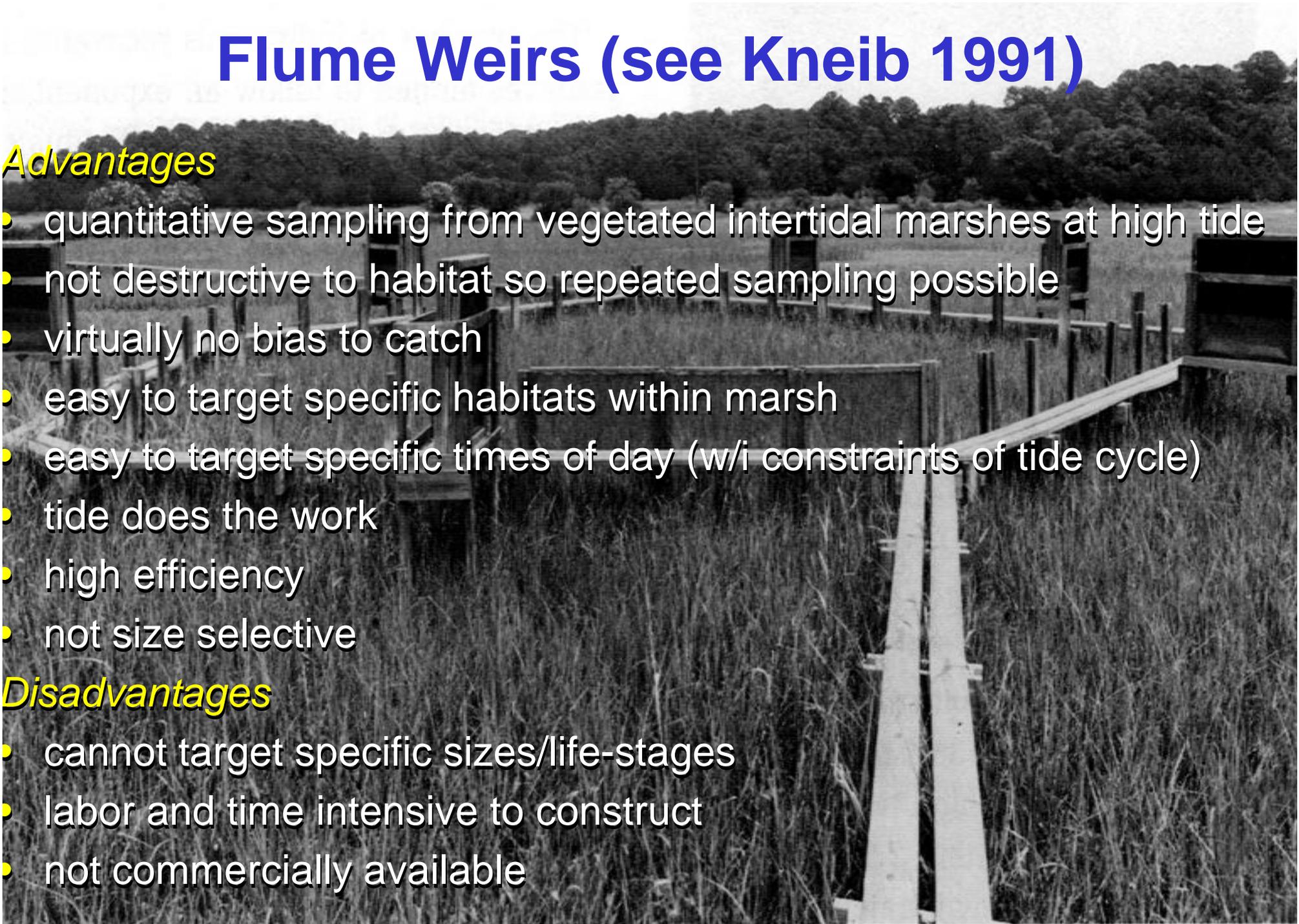
Flume Weirs (see Kneib 1991)

Advantages

- quantitative sampling from vegetated intertidal marshes at high tide
- not destructive to habitat so repeated sampling possible
- virtually no bias to catch
- easy to target specific habitats within marsh
- easy to target specific times of day (w/i constraints of tide cycle)
- tide does the work
- high efficiency
- not size selective

Disadvantages

- cannot target specific sizes/life-stages
- labor and time intensive to construct
- not commercially available



Juvenile and Adult Methods



Active Trap Gears

- pop nets
- drop nets
- throw nets
- lift net
- flume weir

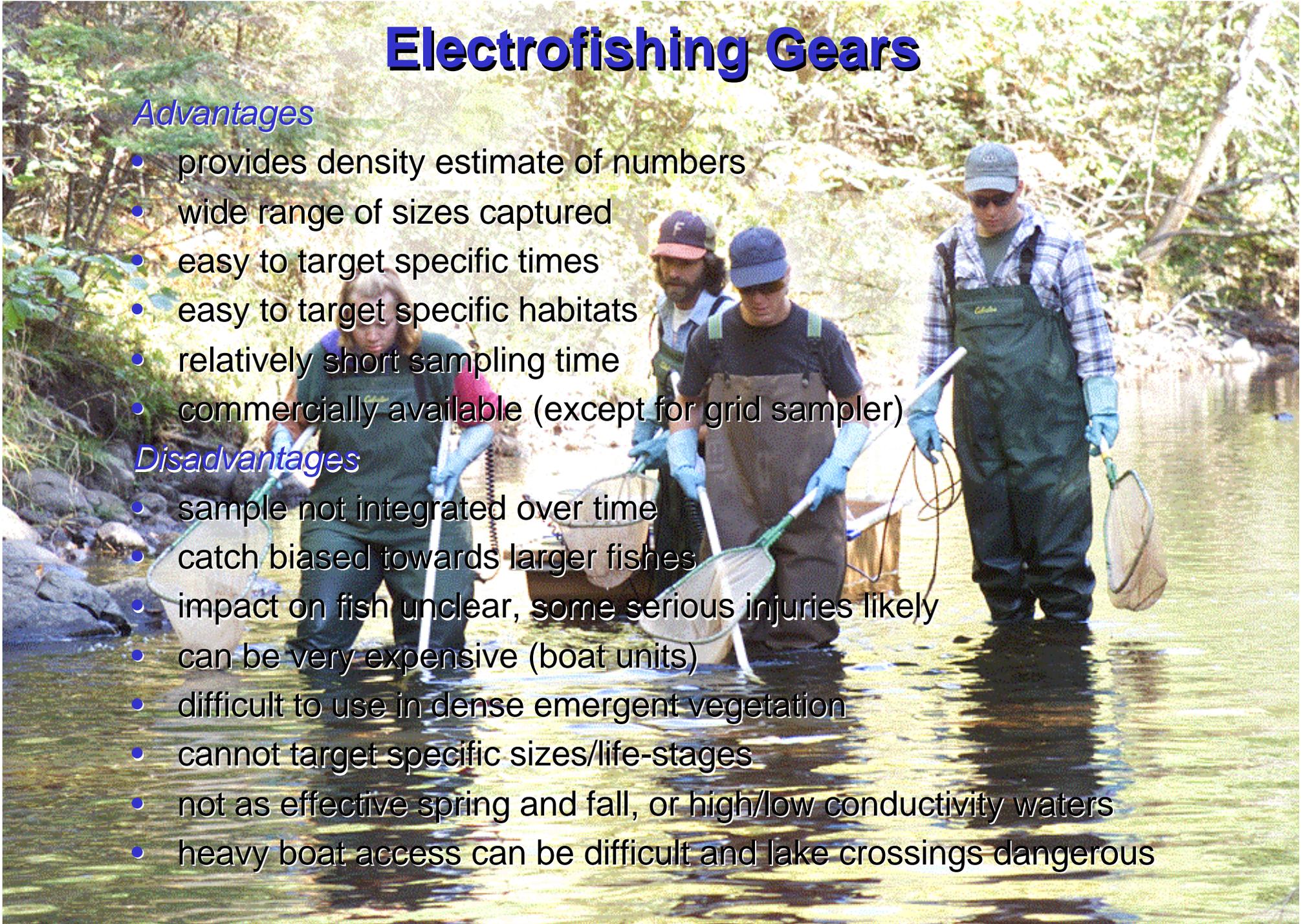
Electrofishing Gears

Advantages

- provides density estimate of numbers
- wide range of sizes captured
- easy to target specific times
- easy to target specific habitats
- relatively short sampling time
- commercially available (except for grid sampler)

Disadvantages

- sample not integrated over time
- catch biased towards larger fishes
- impact on fish unclear, some serious injuries likely
- can be very expensive (boat units)
- difficult to use in dense emergent vegetation
- cannot target specific sizes/life-stages
- not as effective spring and fall, or high/low conductivity waters
- heavy boat access can be difficult and lake crossings dangerous



Larval Light Trap

